The Preparation of Liposomes

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Abstract

A liposome is an artificially prepared vesicle made up of a concentric bilayer of phospholipid structure enclosing an aqueous core. This structure is considered to be amphiphilic, which means it contains both hydrophilic and hydrophobic components. The hydrophilic head is made up of an alcohol and phosphate group. The hydrophobic tail is simply a long fatty acid hydrocarbon tail. The liposomes are used in a variety of applications. In the administration of nutrients and pharmaceuticals, liposomes are incorporated in vaccines to pesticdes for plants. Because of its many efficient attributes, the heating method was used to prepare the liposomes in this experiment. Once intact, the liposomes were analyzed using two forms of confocal microscopy, Scanning Electron Microscopy and Transmission Electron Microscopy. From this form of analysis, it was determined the liposomes were of the appropriate form and structure.

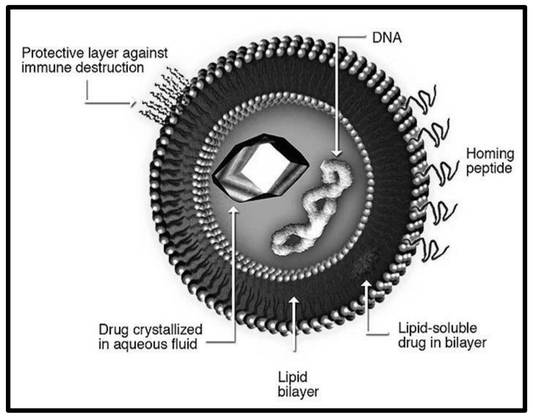

Figure 1: Capabilities of Liposomes

Introduction to Heating Method

In the field of liposome preparation, there are numerous techniques, such as Solvent Injection, Microfluidization, and Sonication. According to Reza Mozafari in Liposomes: An Overview of Manufacturing Techniques, methods akin to Solvent Injection incorporate the usage of organic solvents, which can leave residues in the liposome membrane and result in an increase in toxicity. This article explains the efficiency of the Heating Method by referring to its simple process, lack of usage of organic solvents, and capability to attain a liposome of stable structure. The article, Construction of Stable Anionic Liposome-Plasmid Particles Using the Heating Method: A Preliminary Investigation, testifies to this and even elaborates on their usage in gene transfer and high entrapment efficiencies.

Acknowledgements

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Procedure

Figure 2: Acquire lipid combination

Figure 3: Measure and add Phosphate Buffer Saline

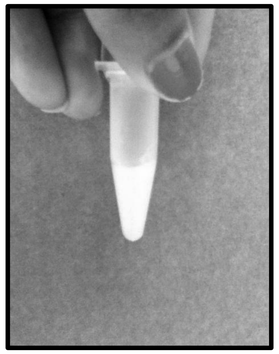
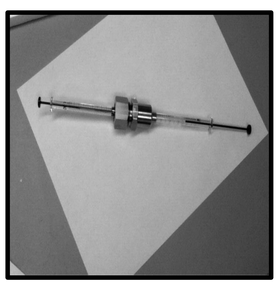


Figure 4: Heat in flask at 100 ˚ C for 1 hour

Figure 5: Filtration System



Characterization/Analysis

Scanning Electron Microscopy- SEM

This type of microscopy incorporates the usage of a beam of electrons in a raster scan pattern. The resultant images show the topography of the liposomes. In Figure 6, the liposome is fully formed. According to the size determination, the liposome is an example of a Small Unilamellar Vesicles.

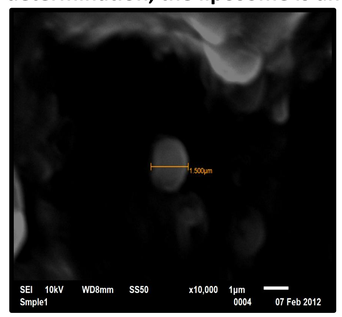


Figure 6: SEM Image

Transmission Electron Microscopy-TEM

This type of microscopy incorporates the transmission of a beam of electrons through the specimen. In TEM captured images, the liposome's internal and membrane structure are apparent. For instance, if there was a break or leakage in the membrane, TEM would be able to identify the damage. In Figure 7, the liposome represented has a correctly formed membrane with no breakage or leakage.

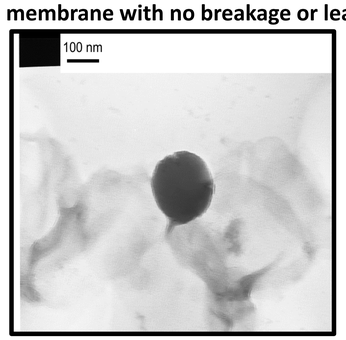


Figure 7: TEM Image

Conclusion

Small Unilamellar Vesicles were successfully created without the usage of organic solvents, which means it is safe to transferred into a biological system.

References

Mozafari, M.Reza."Liposomes: A Overview of Manufacturing Techniques."*Cellular & Molecular Biology Letters.*10.(2005).711-719.Print.

Mozafari,M.Reza."Construction of Stable Anionic Liposome-Plasmid Particles Using the Heating Method: A Preliminary Investigation."*Cellular & Molecular Biology Letters.*7.(2002).923-927.Print